United States Patent [19]

Snyder

[11] **4,404,772**

[45] **Sep. 20, 1983**

[54] **CYLINDRICAL GRINDING MACHINE**

[75] Inventor: **Glenn M. Snyder**, Waynesboro, Pa.

[73] Assignee: **Litton Industrial Products, Inc.**, Waynesboro, Pa.

[21] Appl. No.: **301,725**

[22] Filed: **Sep. 14, 1981**

[51] **Int. Cl.**[3] **B24B 5/04**

[52] **U.S. Cl.** ..... **51/105 R**; 51/165.74; 51/238 S

[58] **Field of Search** ..... 51/95 WH, 105 R, 105 SP, 51/165.74, 165.77, 238 R, 238 S, 238 GG, 239; 82/38 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

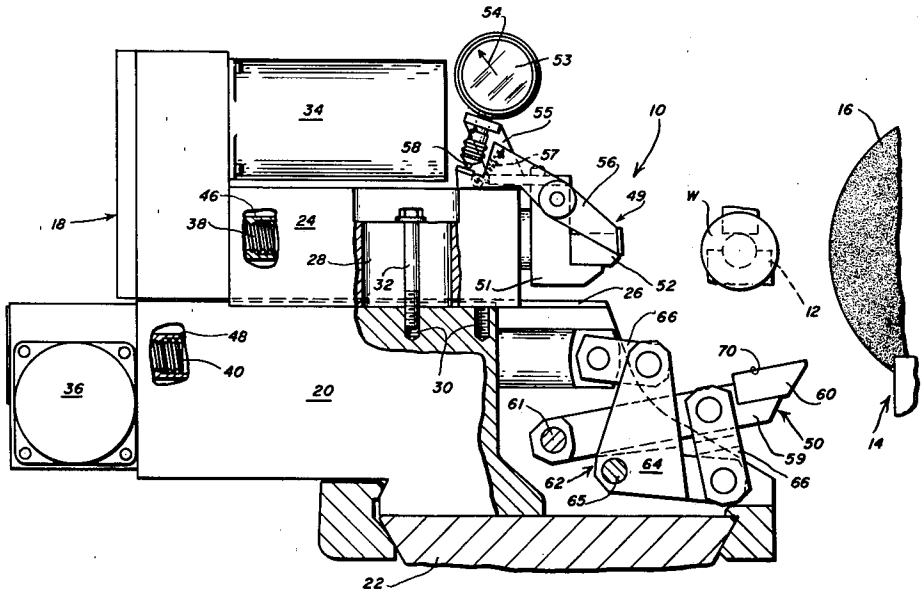
1,543,795	6/1925	Rockwell	51/165.74
1,914,578	6/1933	Norton	51/238 S
2,750,715	6/1956	Farnam	51/238 S
3,503,159	3/1970	Schaller	51/238 R
3,731,566	5/1973	Kurimoto et al.	51/238 S
4,055,027	10/1977	Freddi	51/165.77
4,324,073	4/1982	Belthle	51/238 S

Primary Examiner—Harold D. Whitehead
Assistant Examiner—K. Bradford Adolphson
Attorney, Agent, or Firm—Spencer T. Smith

[57] **ABSTRACT**

A cylindrical grinding machine comprising chucks for supporting and rotating a workpiece about a selected axis, a wheelhead assembly selectively displaceable transverse to the axis including a rotatable grinding wheel for effecting stock removal from the surface of the rotating workpiece, a workrest assembly including a jaw having a workpiece engaging shoe, and means for selectively displacing the jaw for opposing the deflective force exerted by the grinding wheel on the rotating workpiece as it is machined, and means for monitoring the wear of the jaw including an indicator gauge mounted on the workrest jaw including a visually observable needle, a control arm pivotally secured to the workrest jaw having a first workpiece engaging end and a second end operatively associated with the indicator gauge, the control arm having a first position whereat the control arm first end leads the workrest shoe and a second position whereat the control arm first end is flush with the workrest shoe, and a spring for biasing the control arm towards the first position for maintaining the control arm first end in constant tracking engagement with the surface of a rotating workpiece whereby jaw wear will be indicated by the oscillation of the gauge needle and the degree of wear will be indicated by the magnitude of such oscillation.

1 Claim, 2 Drawing Figures



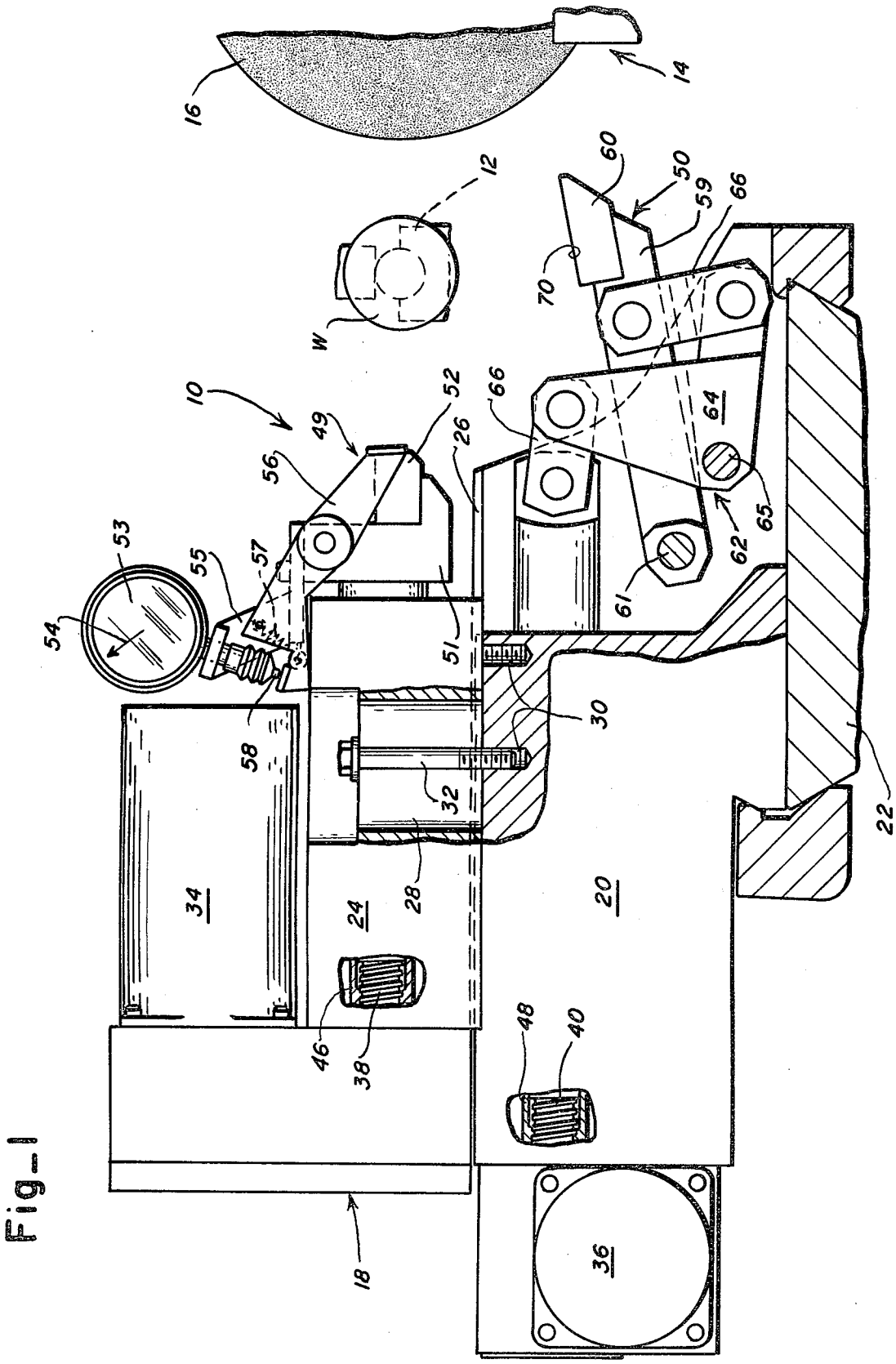

16
14
12
60
50
59
66
70
W
10
52
66
49
26
64
56
65
62
61
53
55
57
54
51
30
58
32
22
34
24
28
20
48
40
46
38
18
36

Fig_1

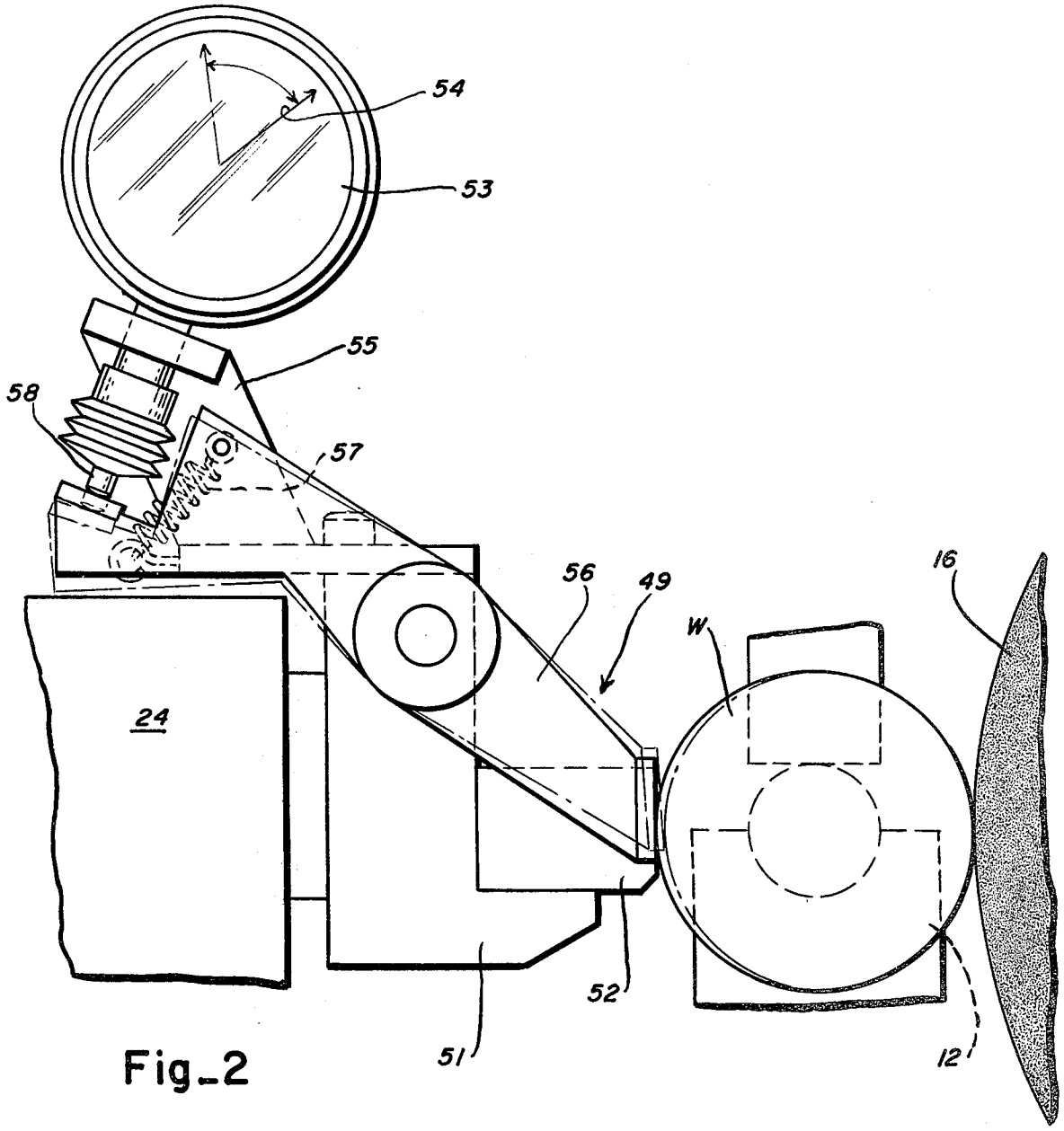


Fig_2

CYLINDRICAL GRINDING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to cylindrical grinding machines.

In cylindrical grinding machines a workpiece to be ground is supported between a pair of rotating chucks or work centers. The axis of the workpiece is aligned with the machine axis defined by the chucks and a rotating grinding wheel is advanced toward the rotating workpiece to abrasively remove stock from its cylindrical surface. The force of the grinding wheel tends to bow the axis of the workpiece and a workrest is provided to minimize such bowing.

Conventionally, the workrest has at least one jaw having a workpiece engaging shoe which is operated via a fixed program to support the rotating workpiece during machining. When the workpiece engaging shoe becomes worn, an adjustment is needed to assure proper functioning of the workrest. Failure to maintain the workpiece aligned with the machine axis will result in the workpiece being ground out of round (slightly egg-shaped).

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a cylindrical grinding machine having a mechanism for monitoring the wear of the workrest jaws during grinding.

Other objects and advantages of the present invention will become apparent from the following portion of this specification and from the accompanying drawings which illustrate, in accordance with the mandate of the patent statutes, a presently preferred embodiment incorporating the principals of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIG. **1** is a side elevational view of a cylindrical grinding machine made in accordance with the teachings of the present invention; and

FIG. **2** is a partial side view of the workrest assembly illustrated in FIG. **1** supporting a workpiece during machining.

DETAILED DESCRIPTION

The cylindrical grinding machine **10** generally includes a chuck assembly **12** at either end of the workpiece for rotatably driving a workpiece W about its axis, a wheelhead assembly **14** including at least one rotatable grinding wheel **16** advanceable to effect stock removal from the rotating workpiece, and a workrest assembly **18**.

The workrest assembly includes a lower housing **20** rigidly attached to the grinding machine base **22** and an upper housing **24** which is slidably supported on lower housing ways **26**. A pair of slots **28** (only one shown) are defined in the upper housing **24** and a plurality of threaded bores **30** are defined in the top surface of the lower housing **20**. Accordingly, when the upper housing **24** is positioned at a selected location along the ways **26**, a clamping bolt **32** may be fed through each slot **28** and threaded into the appropriate lower housing bore **30** to secure the upper housing **24** to the lower housing.

Upper and lower stepper motors **34, 36** secured to the respective workrest housing portions **24, 20**, drive upper and lower feed screws **38, 40** through associated drive shafts **46, 48** to advance or retract upper **49** and lower **50** workrest jaw assemblies.

The upper workrest jaw assembly includes a jaw **51** having a workpiece engaging shoe **52** secured thereto. An indicator gauge **53**, having a visual readout in the form of a pivotally mounted needle **54**, is secured to the jaw **51** via a bracket **55**, and a control arm **56** operatively associated with the gauge needle **54** is pivotally mounted on the upper jaw **51**. A spring **57** extending from the bottom of the bracket **55** biases the control arm **56** to a first position in front of or leading the upper shoe **52**. A spring biased follower **58** of the gauge **53** maintains constant engagement with the end of the remote pivotally mounted control arm **54**.

The lower workrest assembly **50** includes a jaw **59** having a shoe **60** secured to the end thereof. This jaw **59** is pivotally mounted on the lower housing via a shaft **61** and is operatively controlled by the lower drive shaft **48** via a jack linkage **62** which includes a pivot block **64** (also pivotally mounted on the lower housing via a shaft **65**) and two connecting pivot links **66** which pivotally connect one end thereof to the drive shaft and the other end to the lower jaw so that the shaft **48** may displace the lower jaw **58** to support a workpiece having a diameter which may vary over a relatively large range.

To set up the grinding machine for machining workpieces of a selected diameter, a workpiece W is positioned in the chucks **12** and the upper workrest housing **24** is horizontally advanced until upper shoe **52** engages the workpiece. Once positioned, the upper housing **24** is secured to the lower housing **20** with the clamping bolts **32**. To complete set up, the lower stepper motor **36** is operated to raise the lower jaw **59** until the lower shoe **60** engages the workpiece. Thereafter, the upper and lower motors **34, 36** are operated during the grinding cycle according to fixed programs to feed and retract the workrest jaws **50, 59** in a conventional manner to follow the decreasing diameter of the workpiece.

During the machining operation, the spring **57** biases the control arm **56** so that it will remain in constant engagement with the surface of the rotating workpiece. The fixed program for advancing the upper workrest will maintain the upper workrest jaw in constant engagement with this surface until jaw wear occurs. As the jaw wears down, the workrest will no longer constantly maintain engagement with the workpiece which will grind slightly out of round. The needle **54** which always tracks the workpiece surface will begin to oscillate (FIG. **2**) indicating workrest jaw wear and the magnitude of this oscillation is indicative of the degree of wear. When the degree of out-of-roundness reaches an unallowable extent, compensation for workrest jaw wear can be affected. The indicator gauge **53**, accordingly, produces a visual readout indicative of the roundness of the workpiece as it rotates. A constant reading indicates perfect roundness.

What is claimed is:

1. A cylindrical grinding machine comprising

means for supporting and rotating a workpiece about a selected axis,

wheelhead assembly means selectively displaceable transverse to said axis including a rotatable grinding wheel for effecting stock removal from the surface of the rotating workpiece,

workrest assembly means including

jaw means having a workpiece engaging shoe, and

means for selectively displacing said jaw means for opposing the deflective force exerted by said grinding wheel on the rotating workpiece as it is machined, and

means for monitoring the wear of said jaw means including

indicator means mounted on said workrest jaw including a visually observable needle,

control arm means pivotally secured to said workrest jaw means having a first workpiece engaging end and a second end operatively associated with said indicator means,

said control arm means having a first position whereat said control arm first end leads said workrest shoe and a second position whereat said control arm first end is flush with said workrest shoe, and

means for biasing said control arm means towards said first position for maintaining said control arm first end in constant tracking engagement with the surface of a rotating workpiece whereby jaw means wear will be indicated by the oscillation of said needle and the degree of wear will be indicated by the magnitude of such oscillation.

* * * * *